JAMES W. SEWALL COMPANY
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Harnessing the Information Revolution

Using the Internet, GeoDatabase Technology, and Data Warehousing to Provide Efficient and Effective Installation Management

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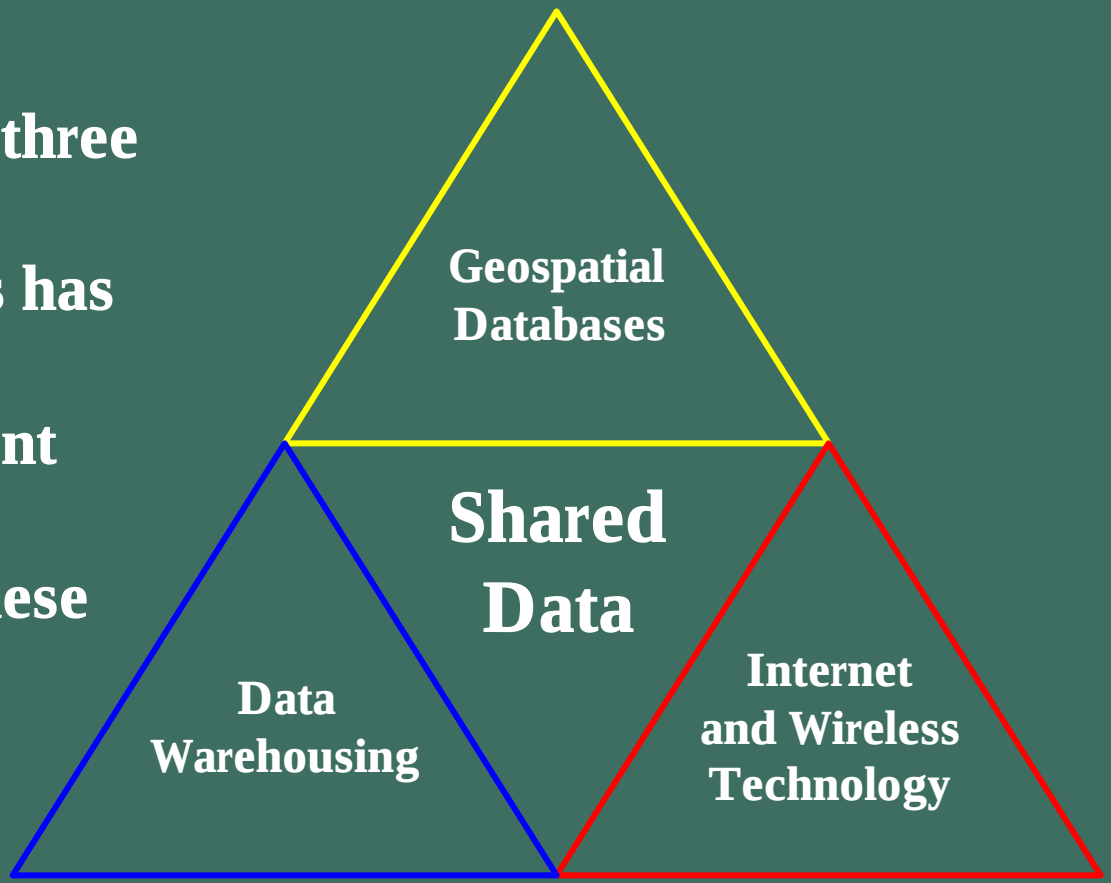
James W. Sewall Company

Barriers to Successful GIS Implementation

- **Often, data is fragmented across the organization**
- **Installations may have no central GIS proponent, coordinator, or technical personnel that can influence GIS decisions for the installation**
- **Data is often of variable quality and currency**
- **Installations have multiple data platforms depending on the application of the data (ESRI for environmental analysis, Intergraph for engineering analysis, AutoCAD for facility data, etc.)**
- **It is difficult to ensure adequate, long-term GIS funding**

Technological Advancements

The recent maturation of three technological advancements has coincided to provide efficient and effective solutions to these obstacles:



Geospatial Databases

- **Geospatial coordinates stored in the database**
- **Data can be stored as Binary Large Objects (BLOB's)**
- **Connectivity Rules**
- **Association Rules**
- **Allows various systems to access graphical data**

node : Table

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Record: 1 of 27

Geospatial Data Evolution

Historically, databases made implied use of the spatial component of the data sets; e.g. address data existed but was not linked to a map.

Traditional database programs did not support graphics or spatial objects. Most modern relational database programs have added support for graphics: data models have been extended to store spatial data and query engines have been expanded to permit spatial queries.

Dependency on specific graphic formats for spatial data is diminishing; graphic data can be stored as database objects and the graphics created on the fly.

What is a Data Warehouse System?

"…a repository of information..built from distributed and often departmentally isolated data throughout an enterprise..."

"…enterprise data system…"

"…subject-oriented, non-volatile, time-variant, integrated collection of data used for decision support…"

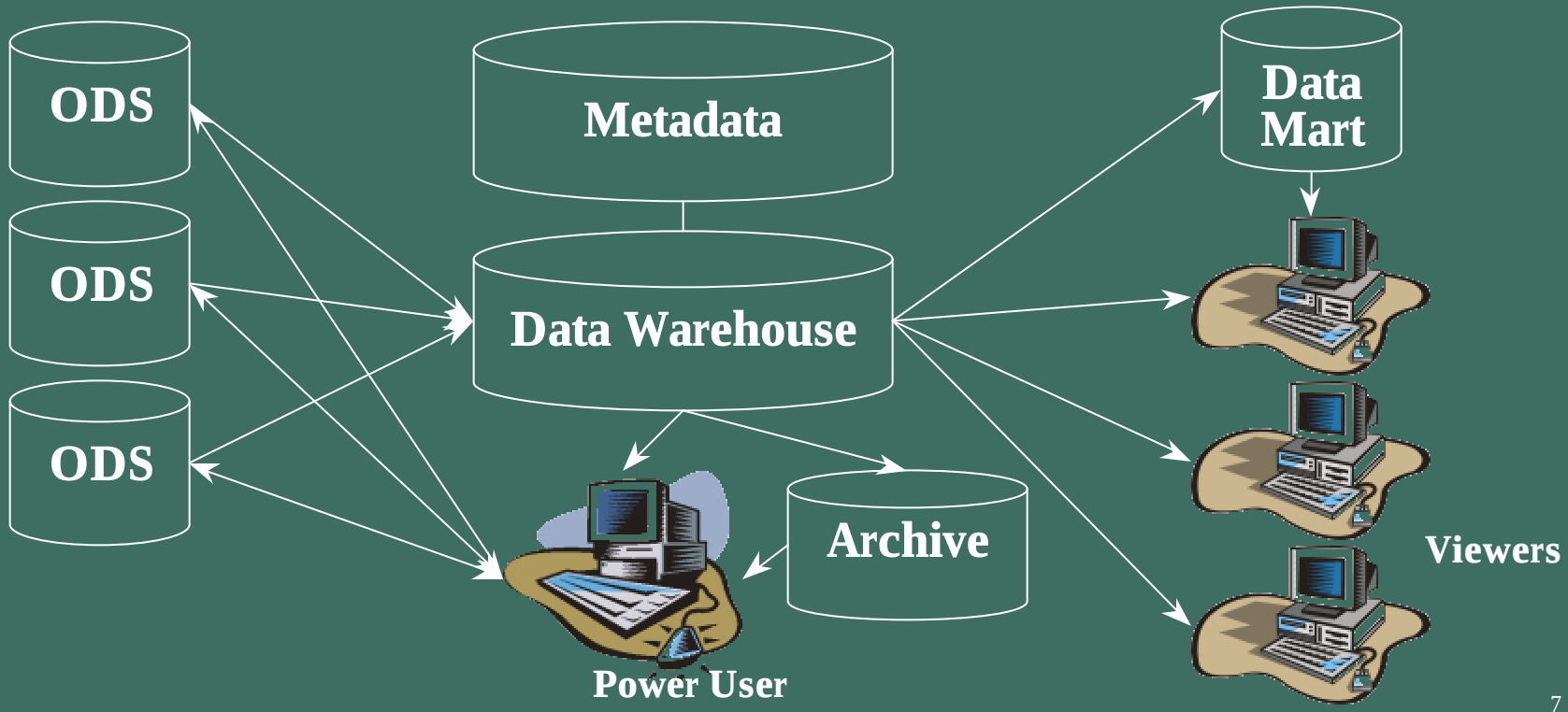
"…an architecture for organizing an IS…"

"…centralized data for decentralized processing…"

ALL OF THE ABOVE and MORE

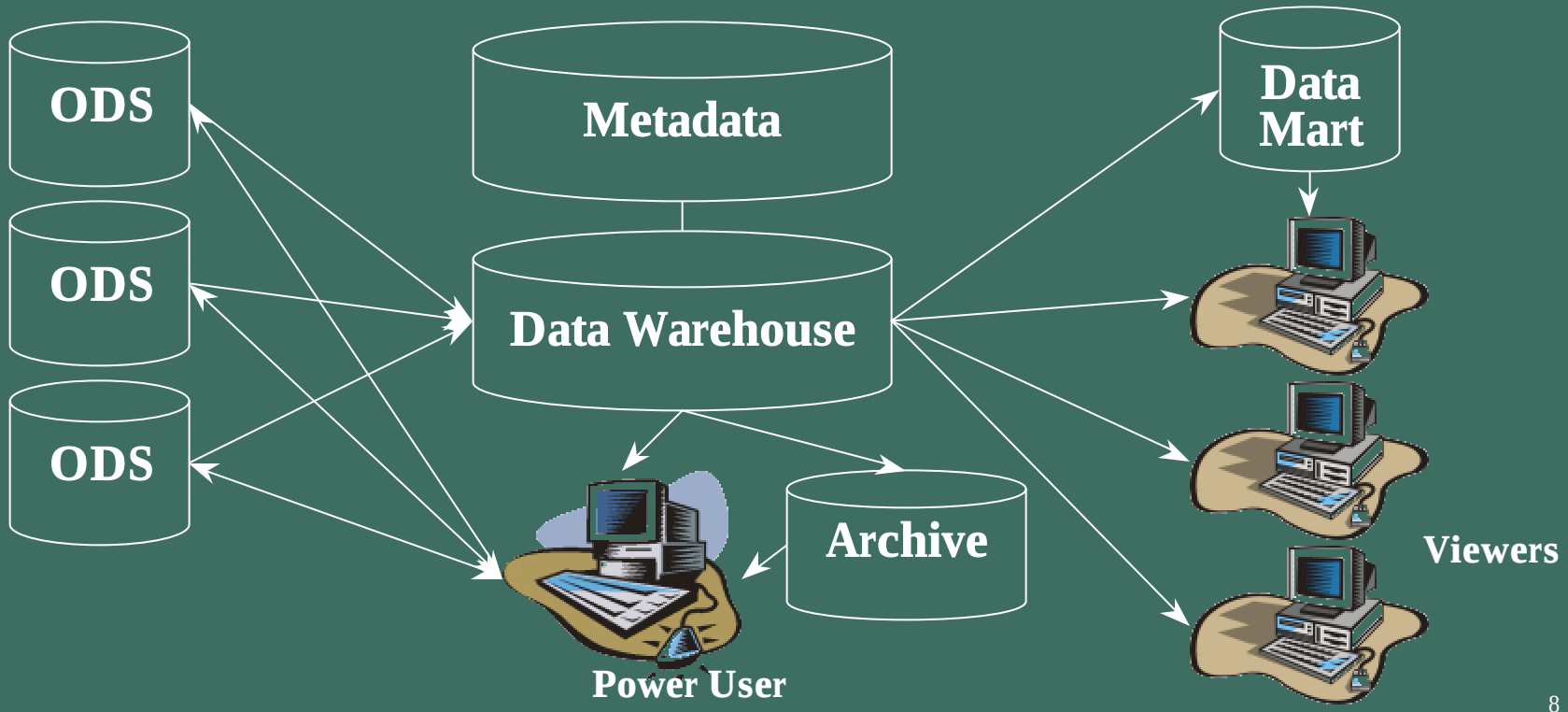
What is a Data Warehouse System?

Short Definition: A collection of spatial and non-spatial data, appropriately organized and maintained, used to support business processes.



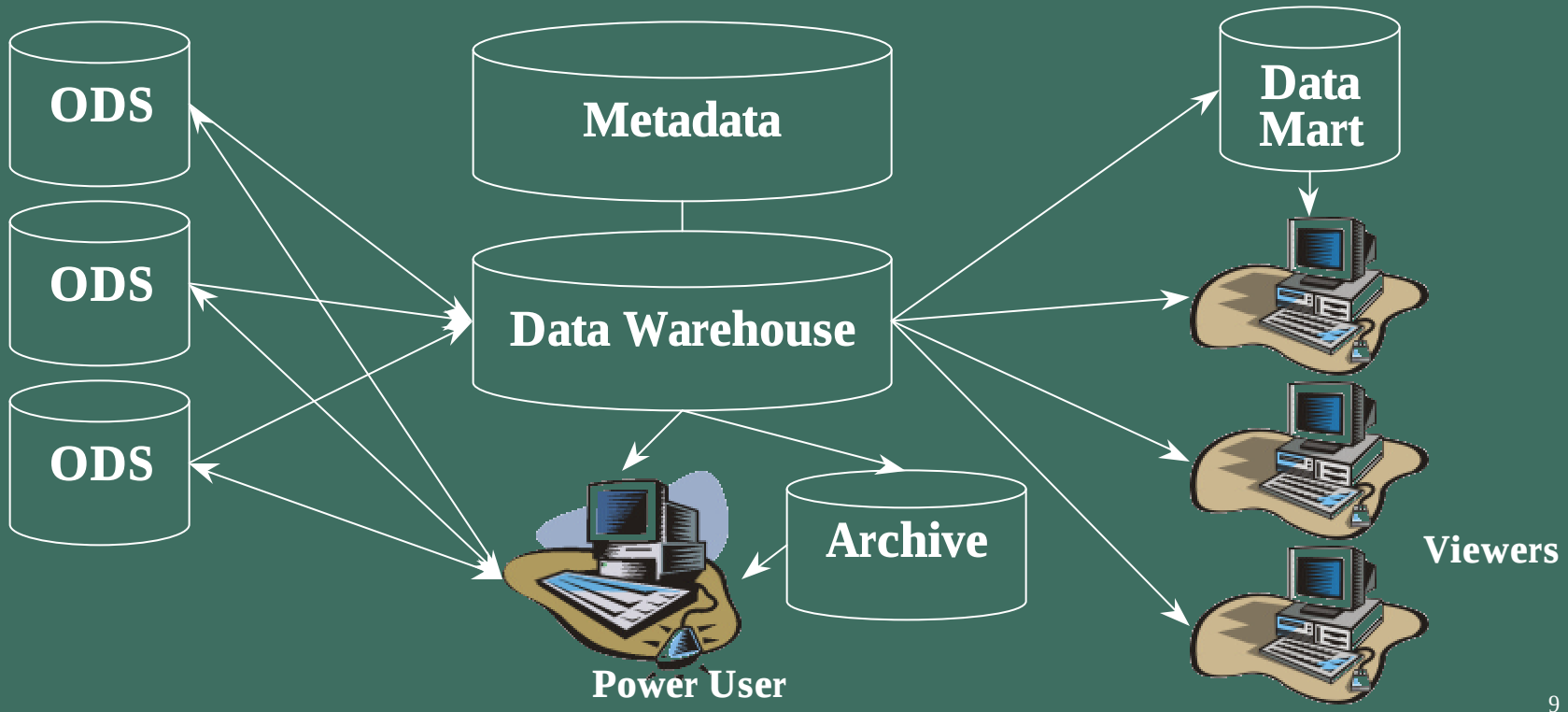
What is a Data Warehouse System?

Operational Data Store: Dynamic repository for data edits. Changes to the ODS populate the Data Warehouse periodically. Often originate as legacy systems.



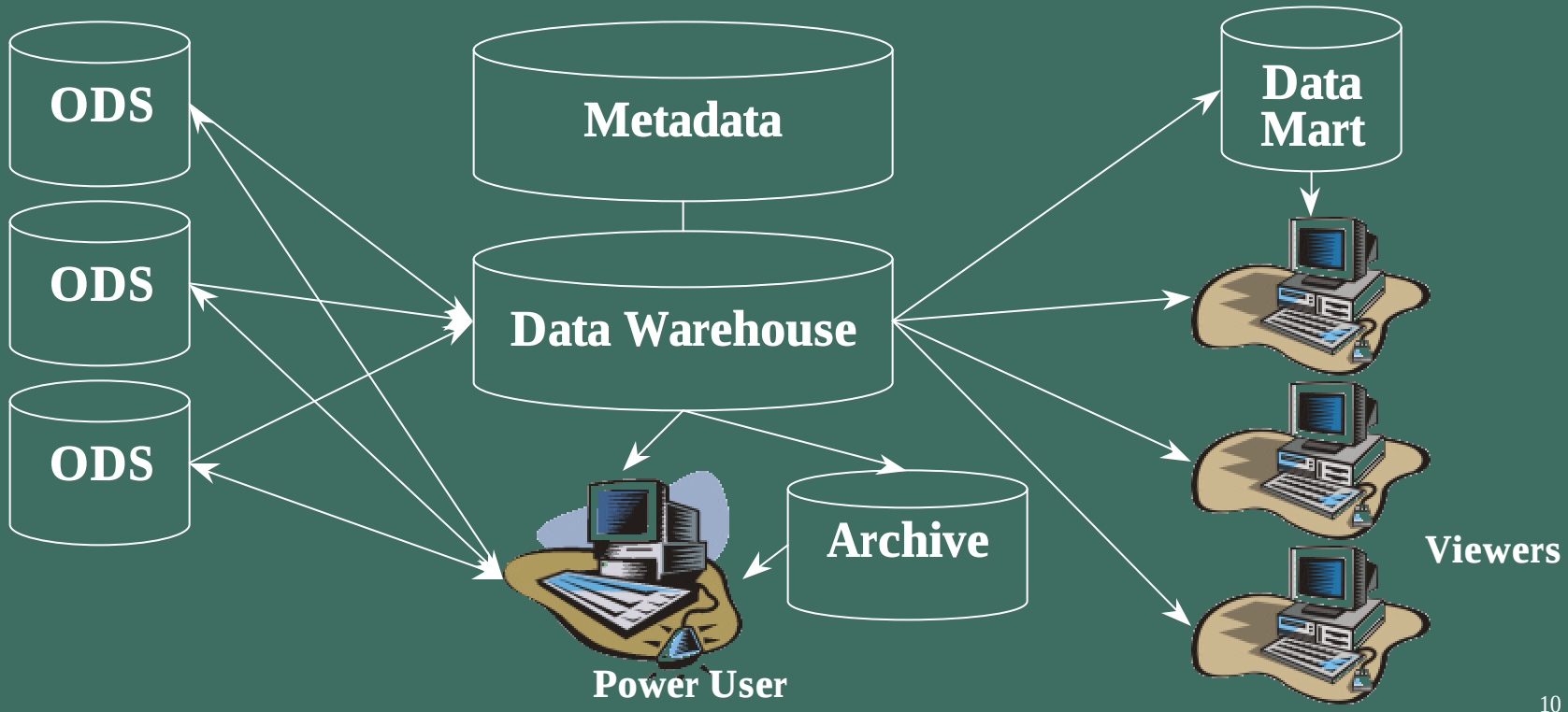
What is a Data Warehouse System?

Data Warehouse: Static repository for enterprise data. Provides users with read-only viewing of static data.



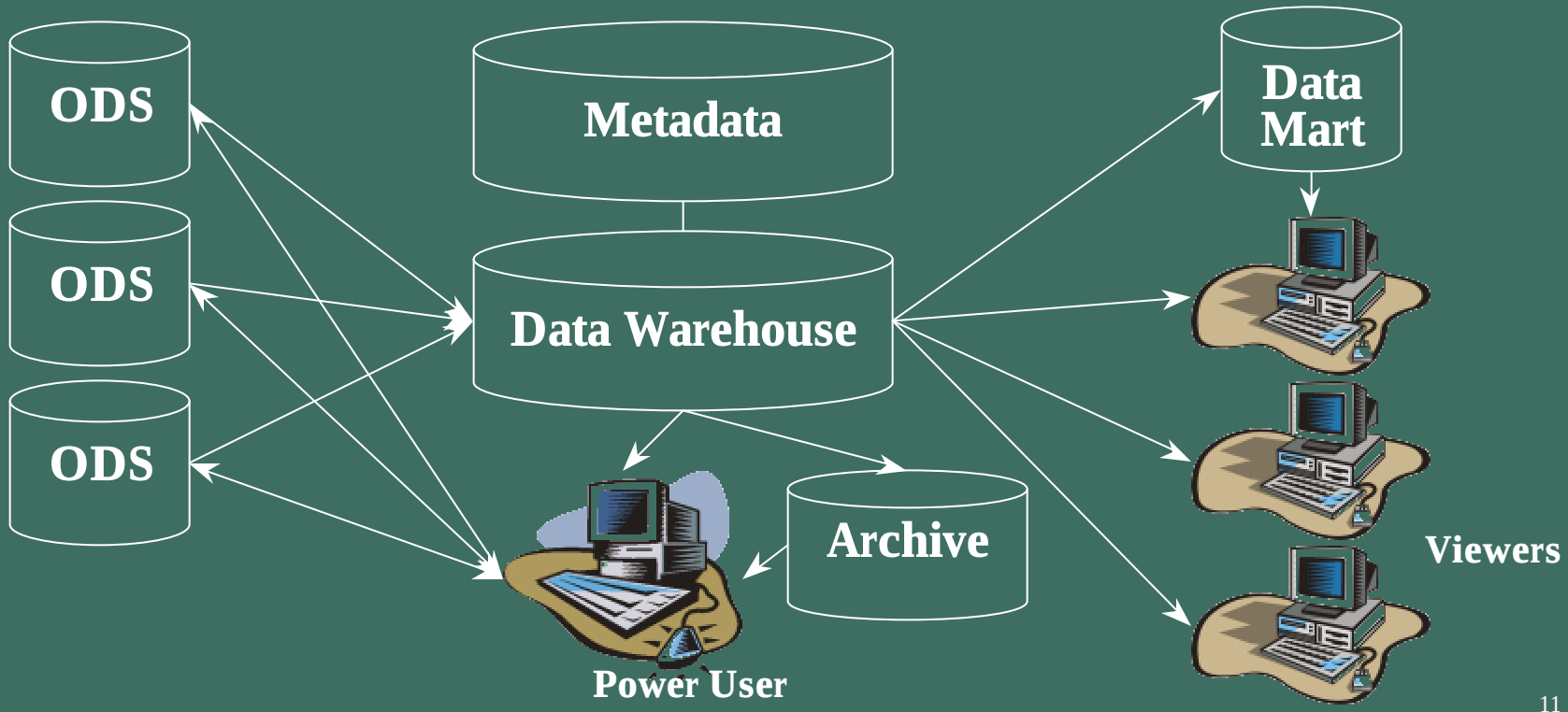
What is a Data Warehouse System?

Metadata: Includes data descriptors, overall system data architecture, and rules for data transactions and relationships.



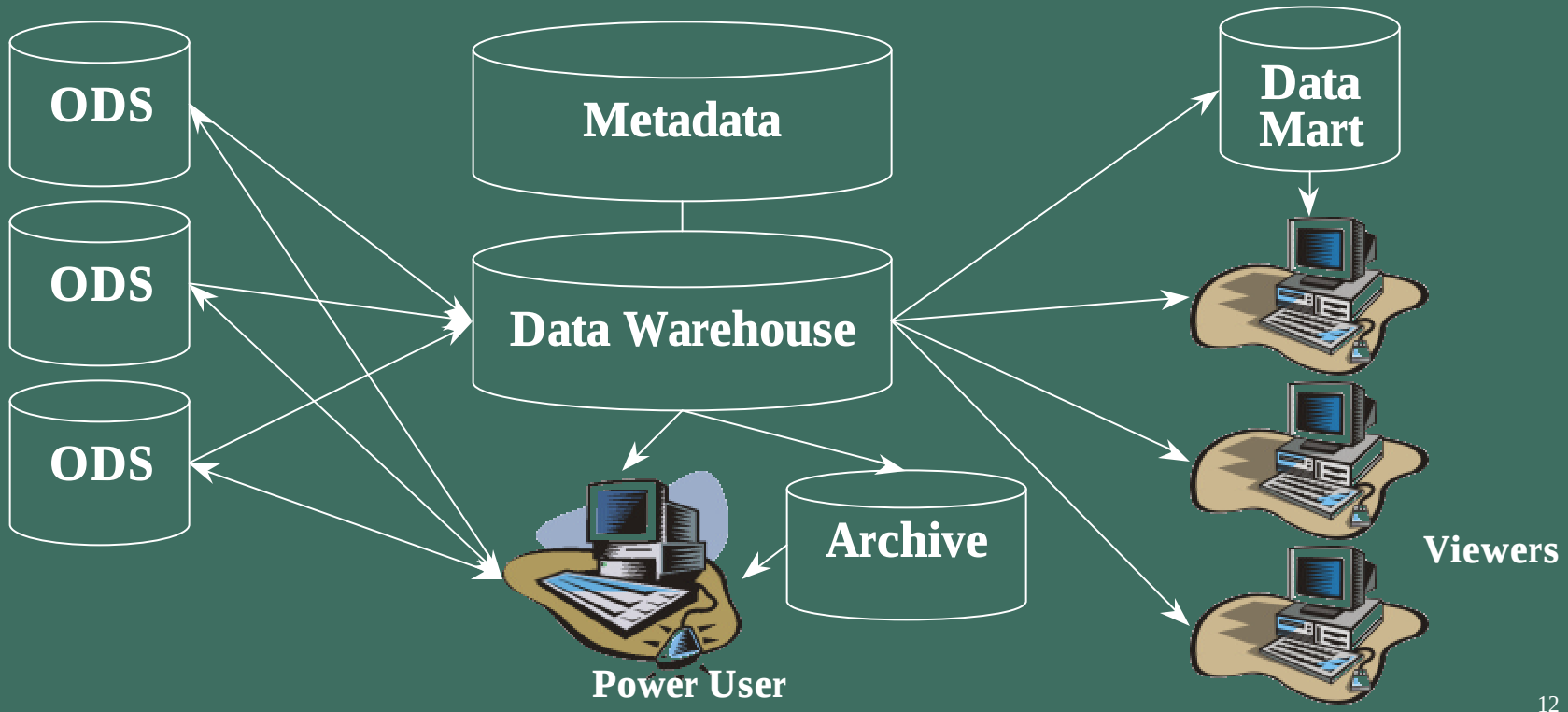
What is a Data Warehouse System?

Data Mart: Subset of Data Warehouse data, or independent data keyed to Data Warehouse. May include data summaries, and may be cached on clients for rapid access.



What is a Data Warehouse System?

Archive: Static repository for historical data. Used for long-term trend analysis.



Goals for a Data Warehouse...

Provide centralized data storage for access to all required data from a users desktop in a form that will support the user's needs.

Implications for a Data Warehouse...

- **Structure**
- **Integrity**
- **Standards**

Why a Data Warehouse?

- **Provides users with the data they need to do their jobs**
- **Support better decision making processes**
- **Collect and house all data in one place**
- **Remove redundancies and discrepancies in data**
- **Support applications and uses not envisioned or integrated into operational systems (i.e., separate the data from the tools)**

Potential Uses of an Installation-Wide GIS

- **Planning**
  - **housing availability and use**
  - **new facility siting**
  - **energy studies**
- **Environmental**
  - **land use management - habitat and species data**
  - **cultural resource management - artifact and historic structure data**
  - **emergency spill response**
  - **monitoring well analysis**
- **Operations and Logistics**
  - **current status of equipment, supplies, and personnel**

Potential Uses of an Installation-Wide GIS

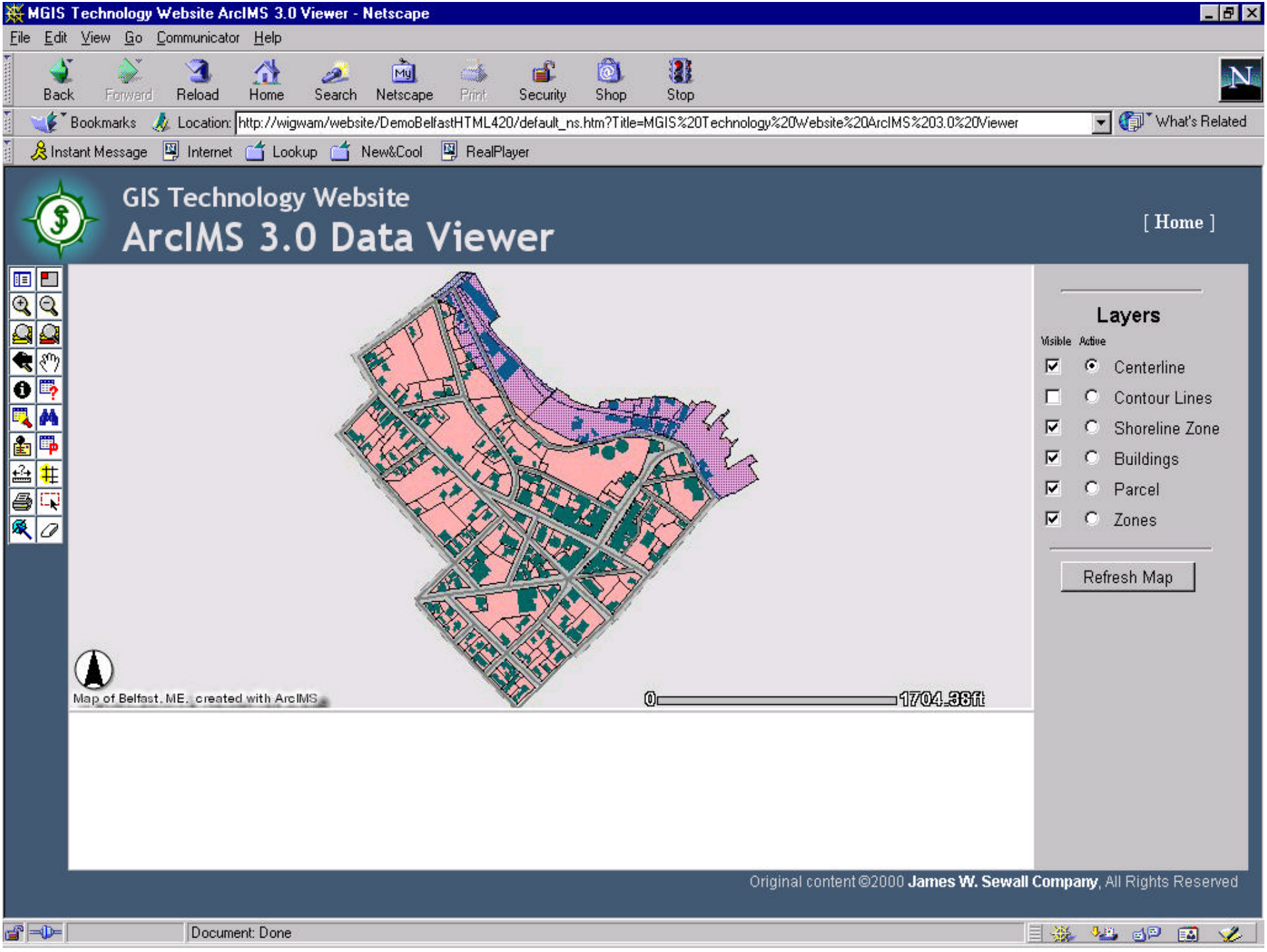
- **Operations and Maintenance**
  - **work order status and processing**
  - **facility data and maintenance schedules (roofs, roads, etc.)**
  - **emergency response**
  - **O&M manual data**
  - **as-built facility data**
  - **digging permits**
- **Installation Tenants**
  - **housing availability**
  - **work order requests and status**

Internet and Wireless Technology

- **Allow simple access to data without complex software or hardware**
- **Data can be transmitted via Internet, wireless, or CD-ROM for remote users**
- **Allows users to readily access only the data they need for their specific tasks**

Internet Applications

- **Intergraph: Geomedia WebMap**
- **ESRI: Internet Map Server**
- **Autodesk: Map Guide and OnSite**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Map of Belfast, ME, created with ArcIMS
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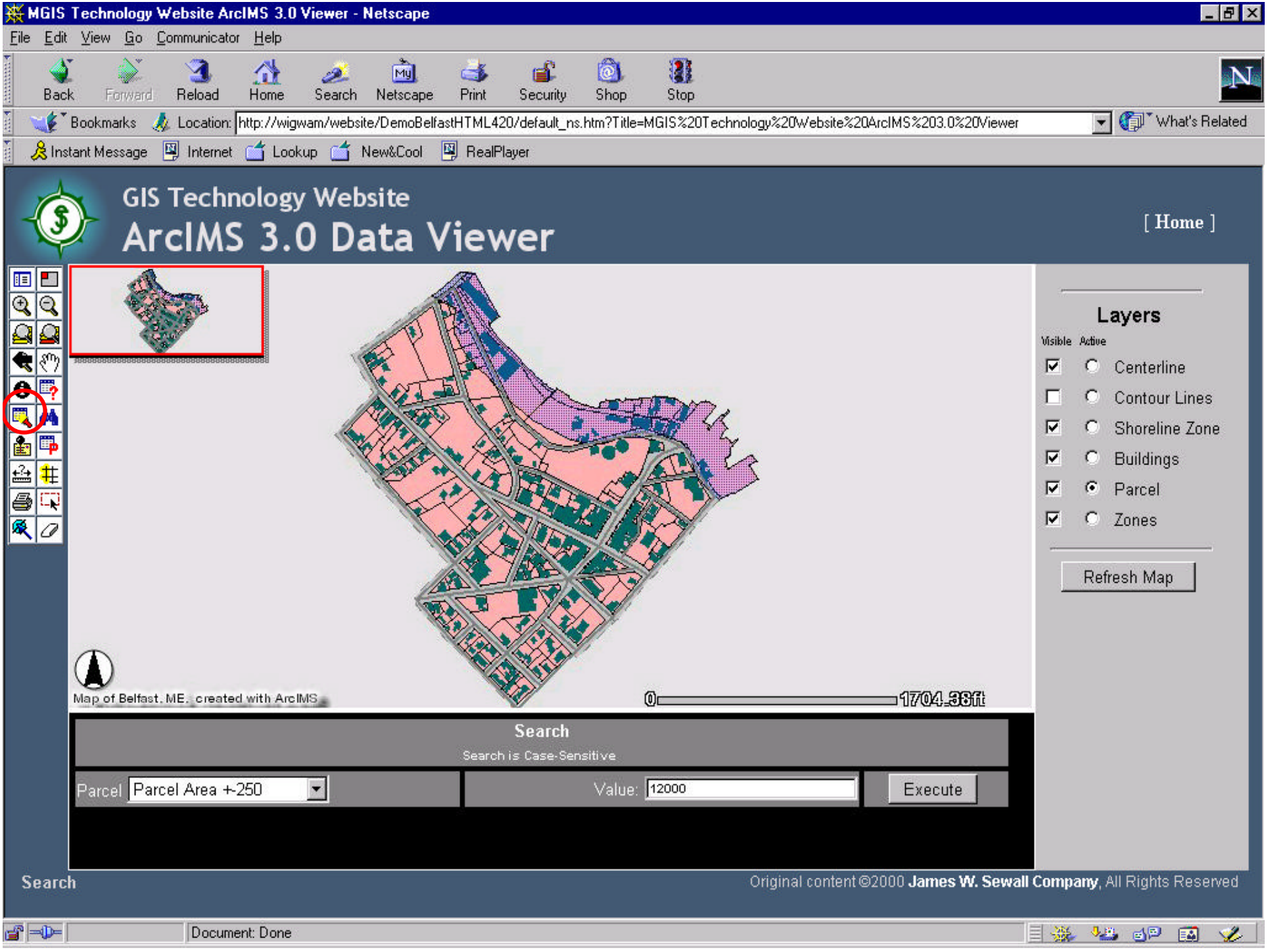
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Refresh Map

Parcel

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2	013-085	11982	491	1359	2035	41	BRIDGE	ST	PATRICIA A. RAUCH	41 BRIDGE STREET	BELFAST	ME	[polygon]	16
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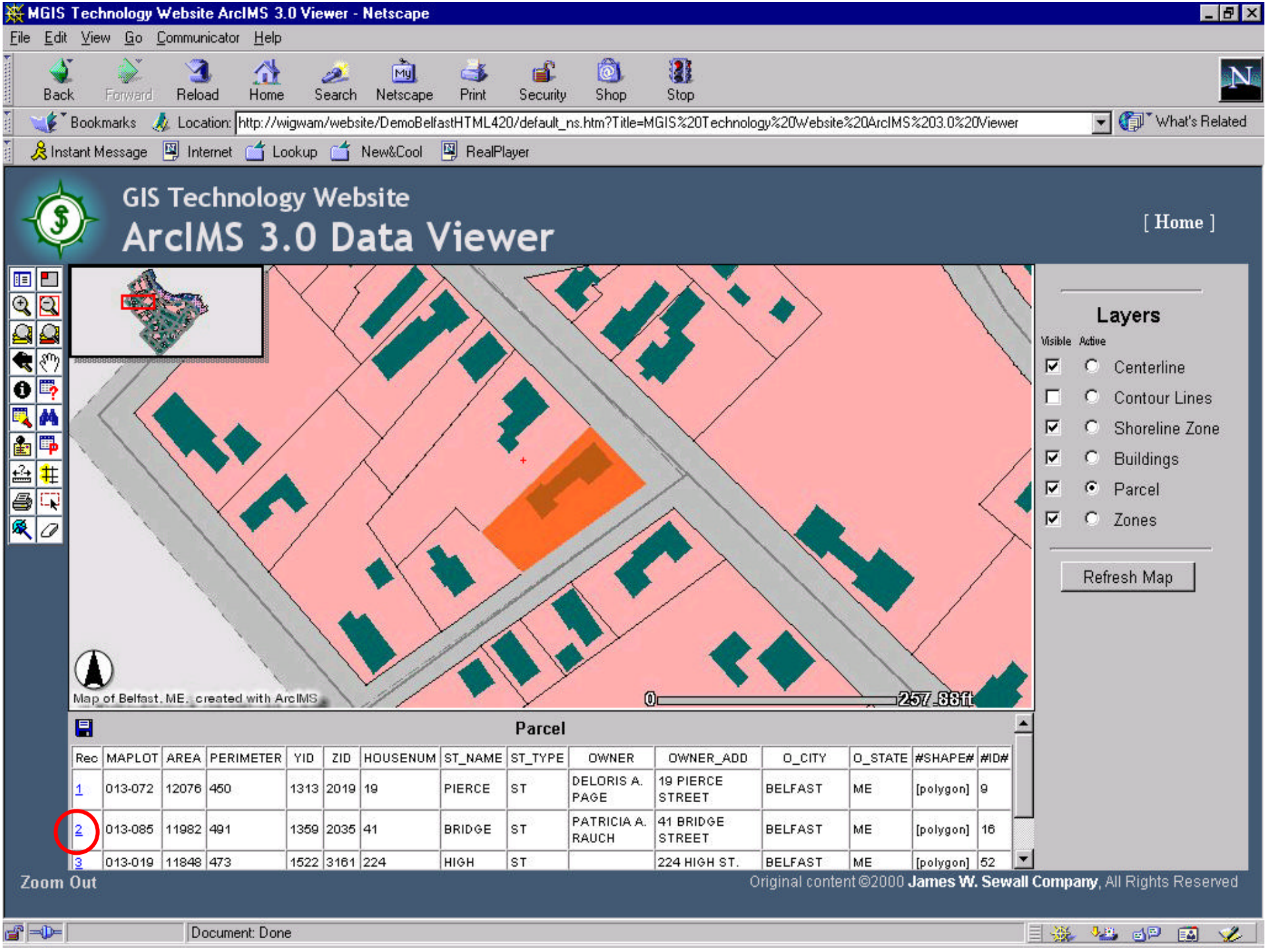
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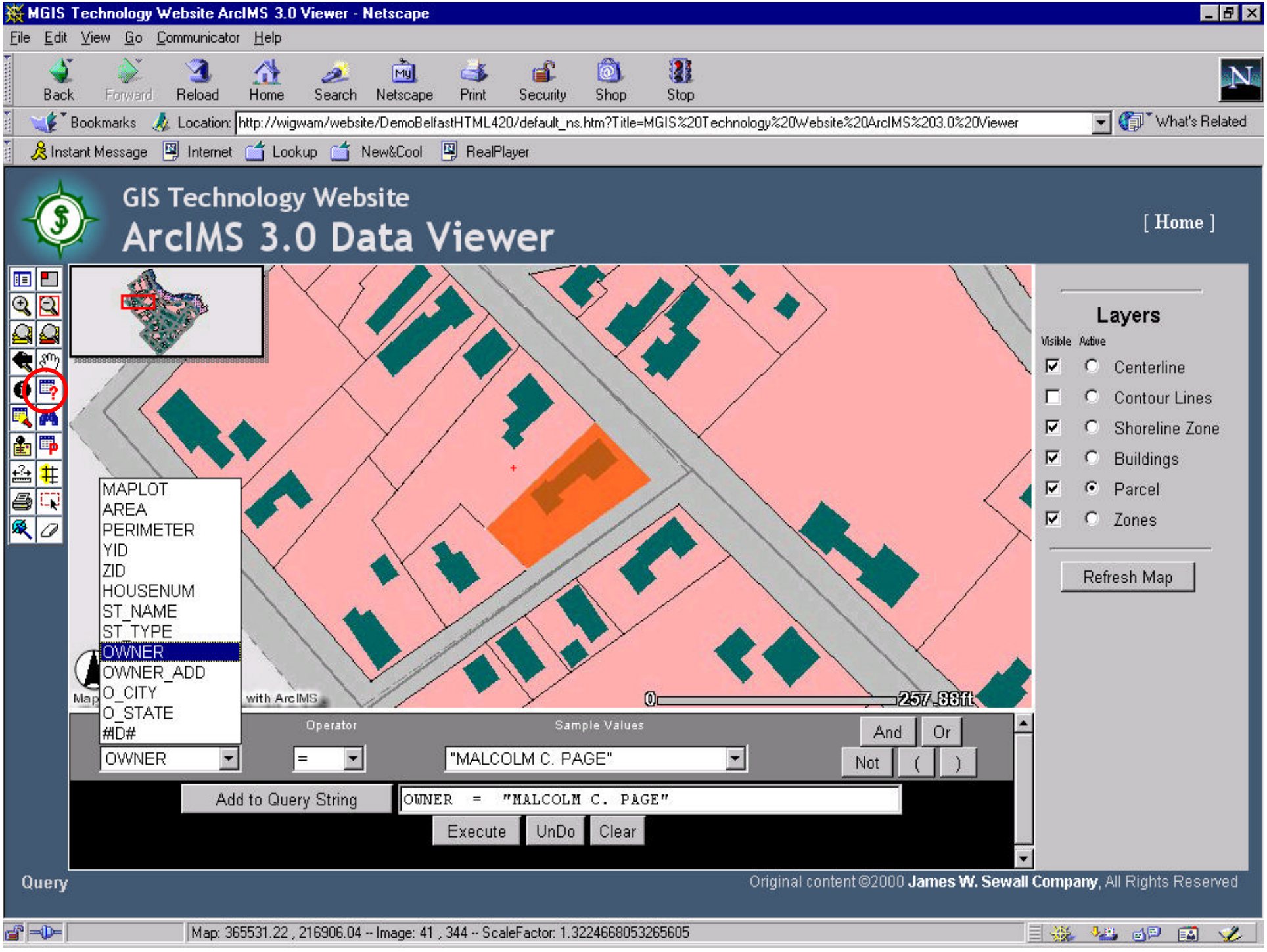
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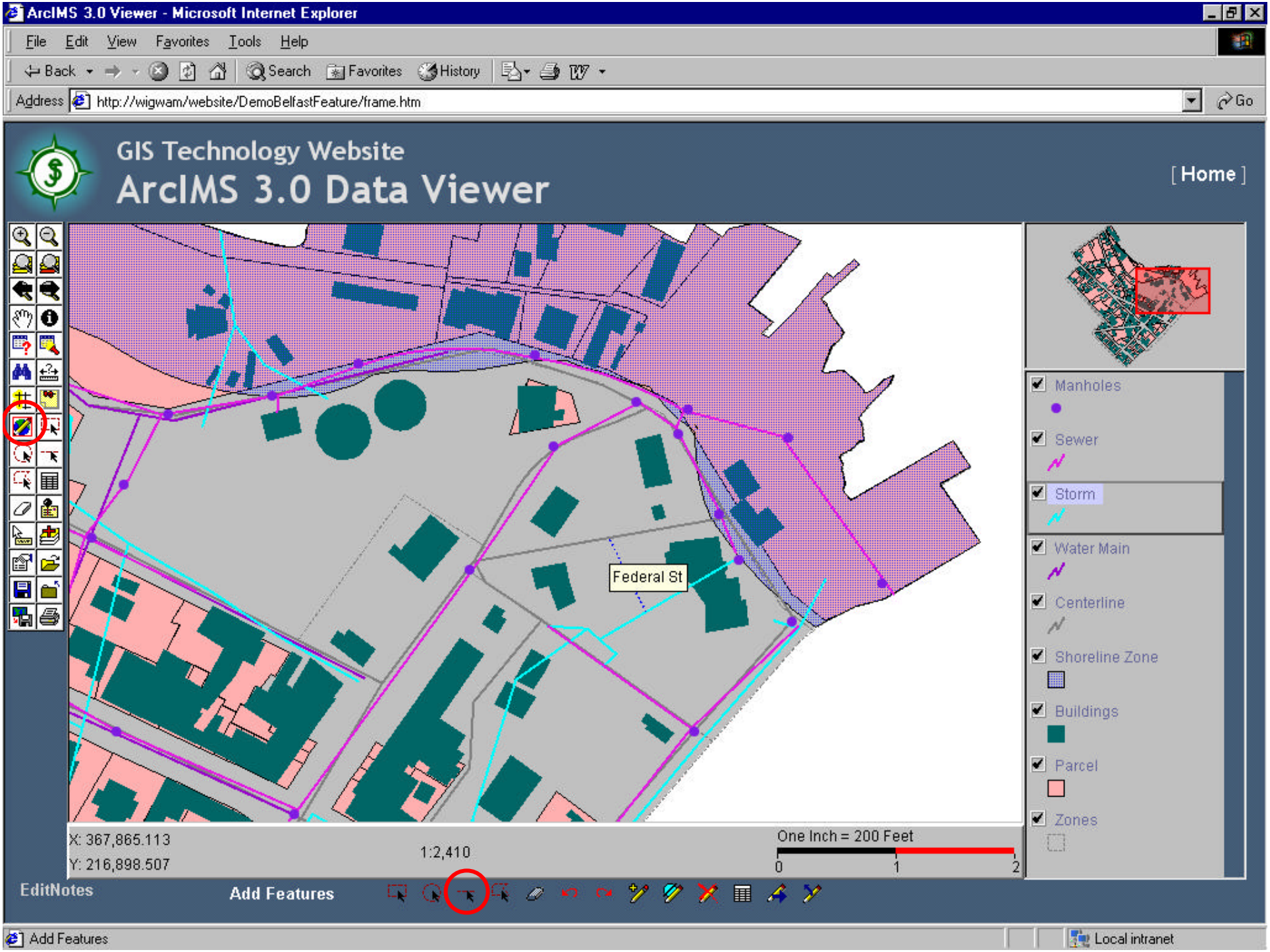
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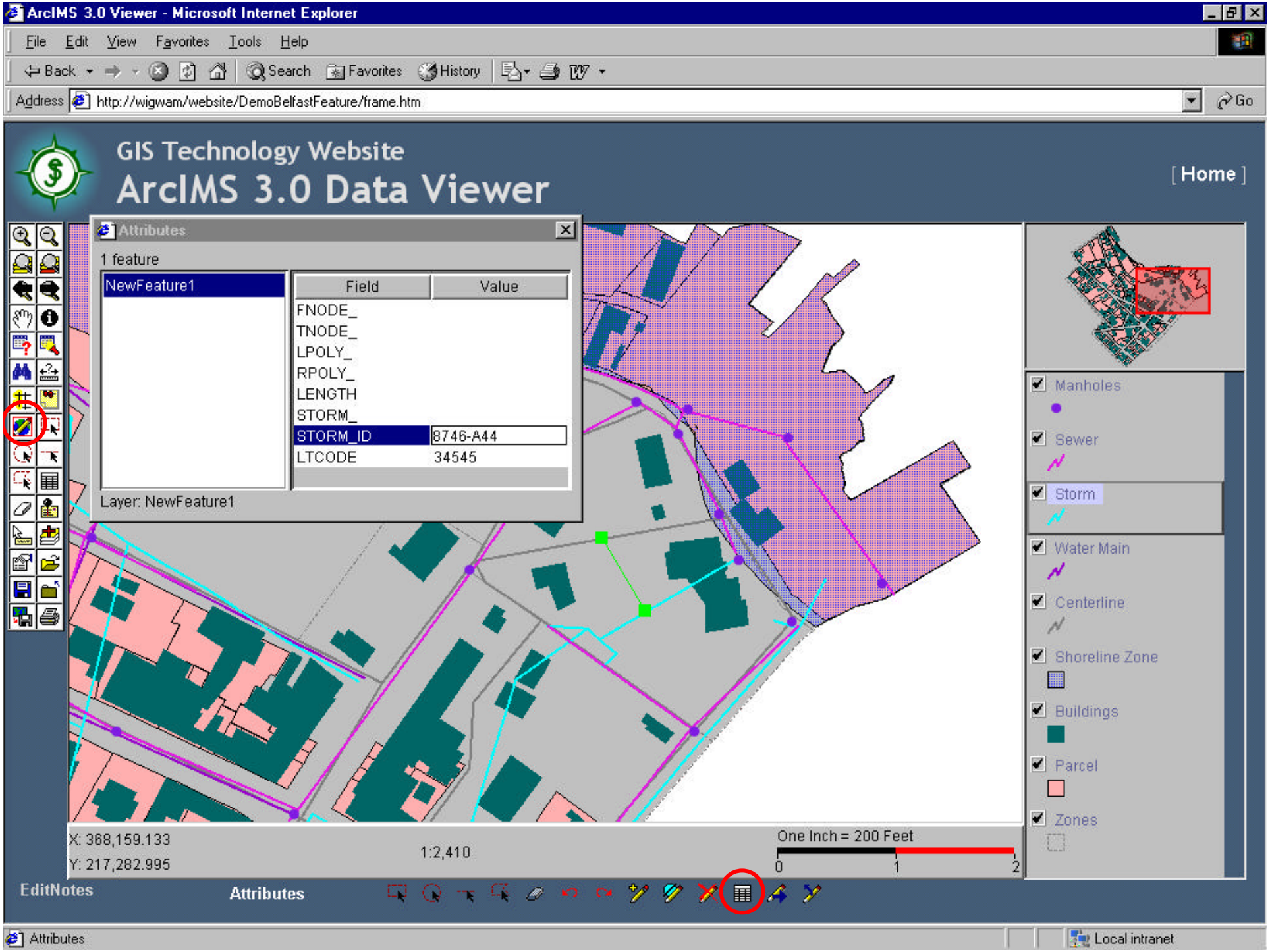
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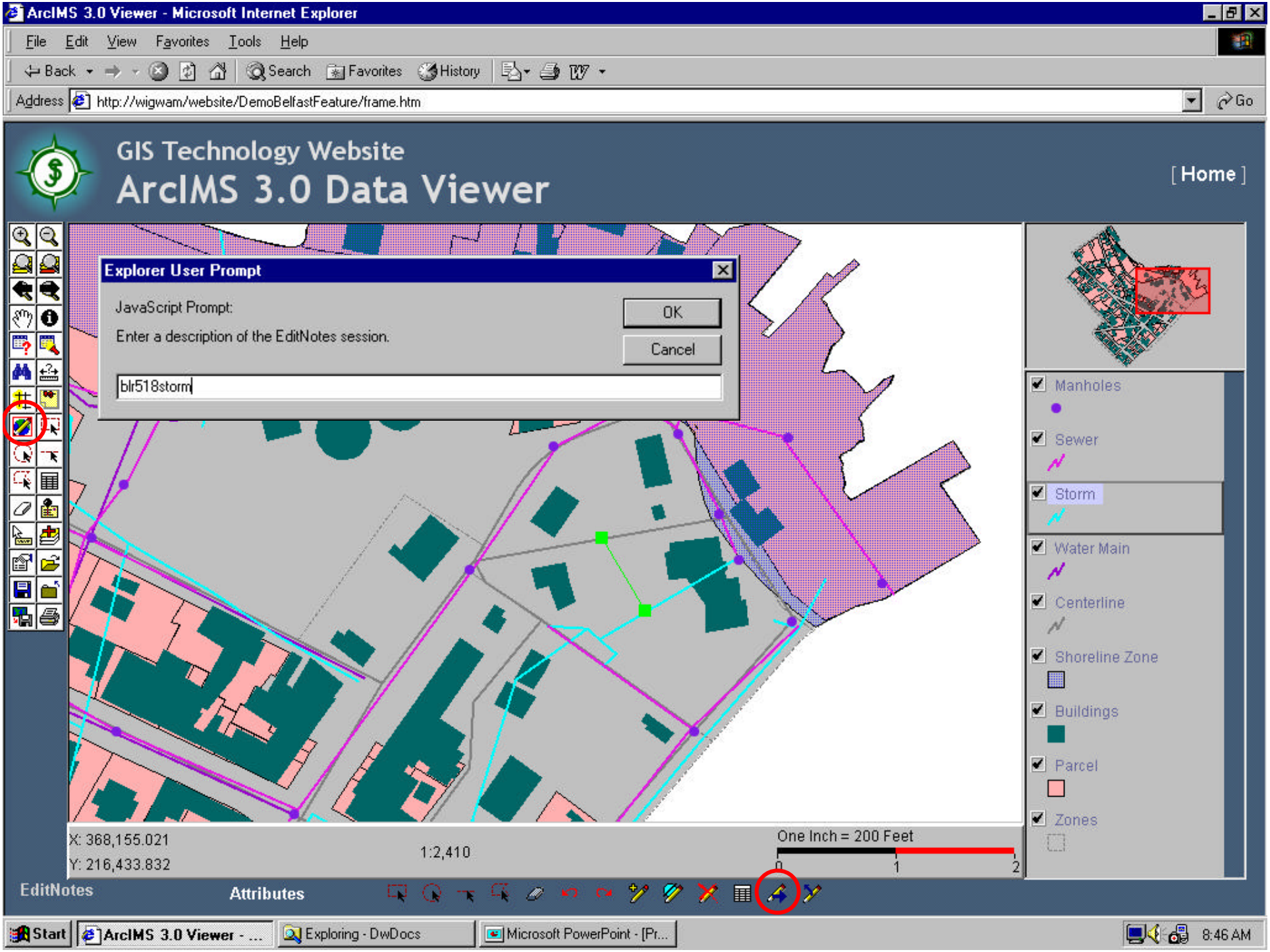
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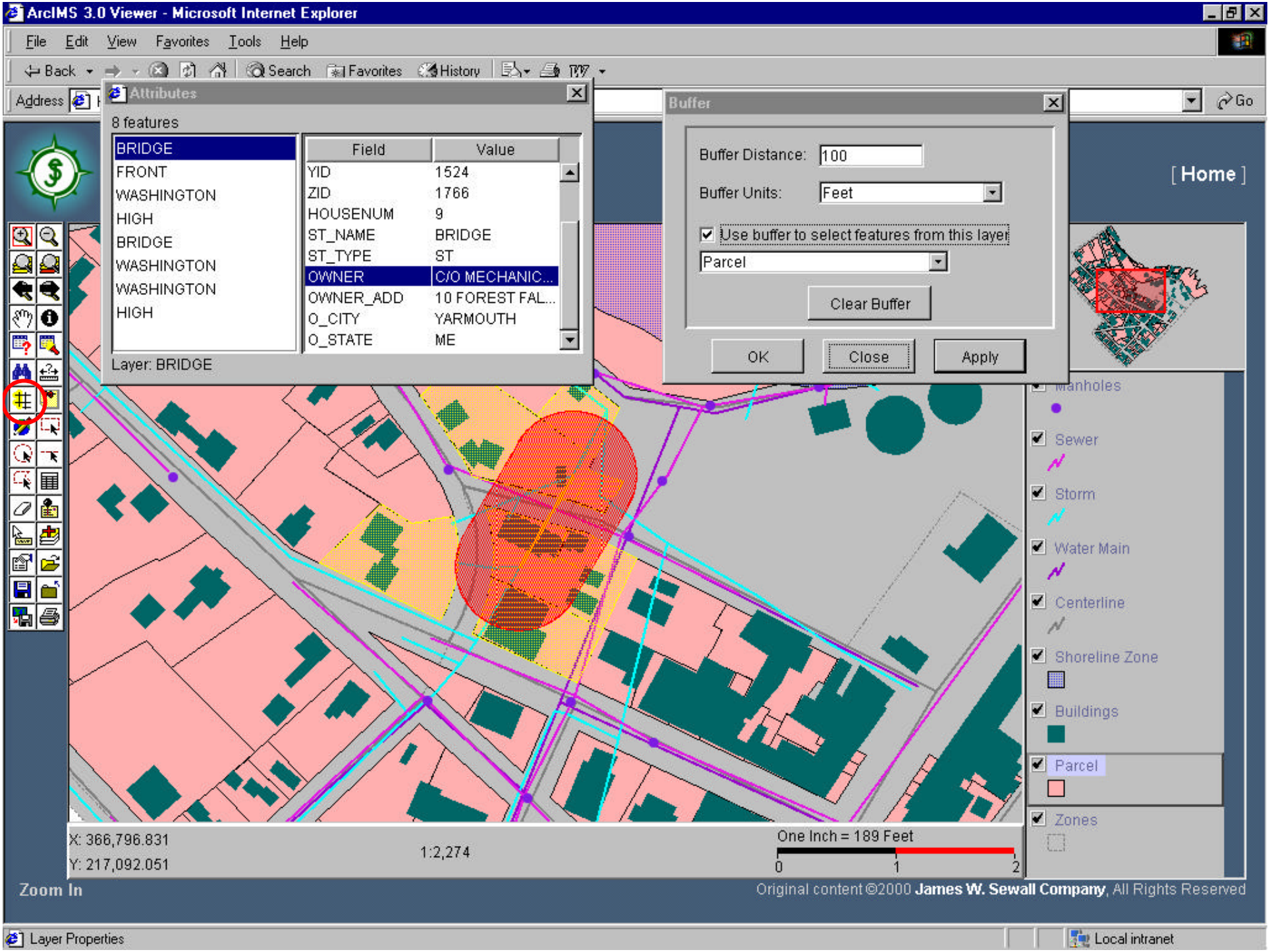
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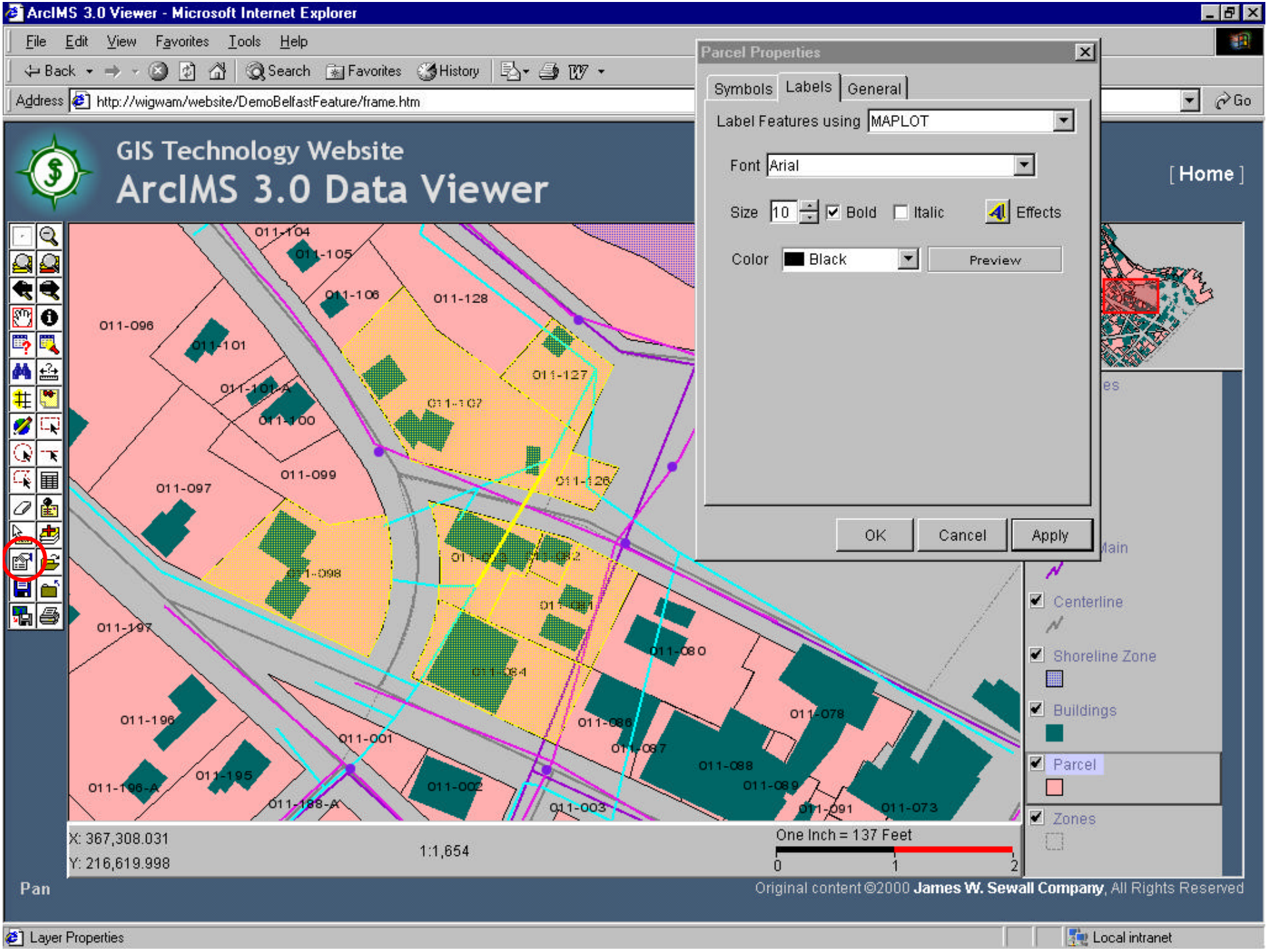
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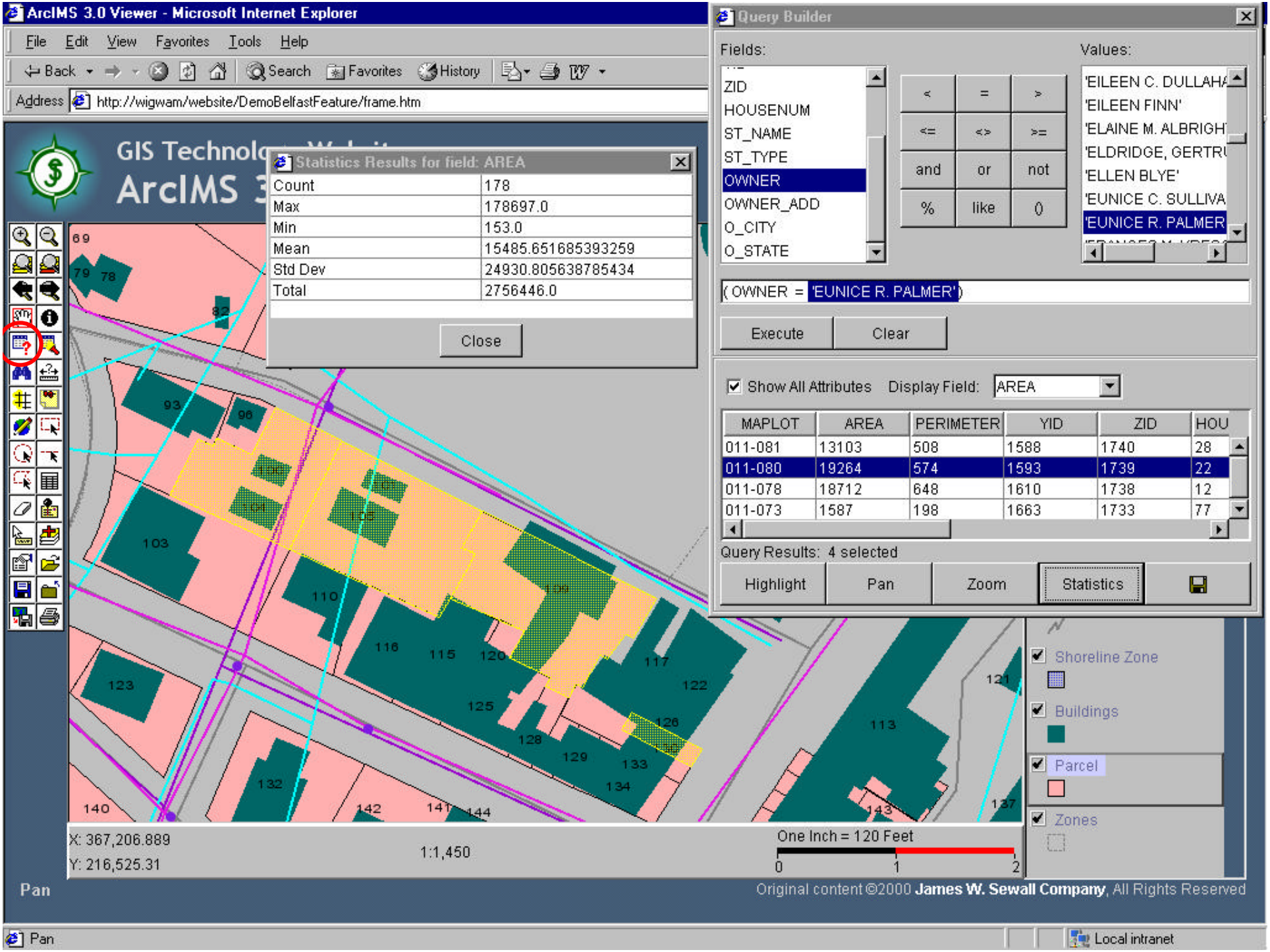
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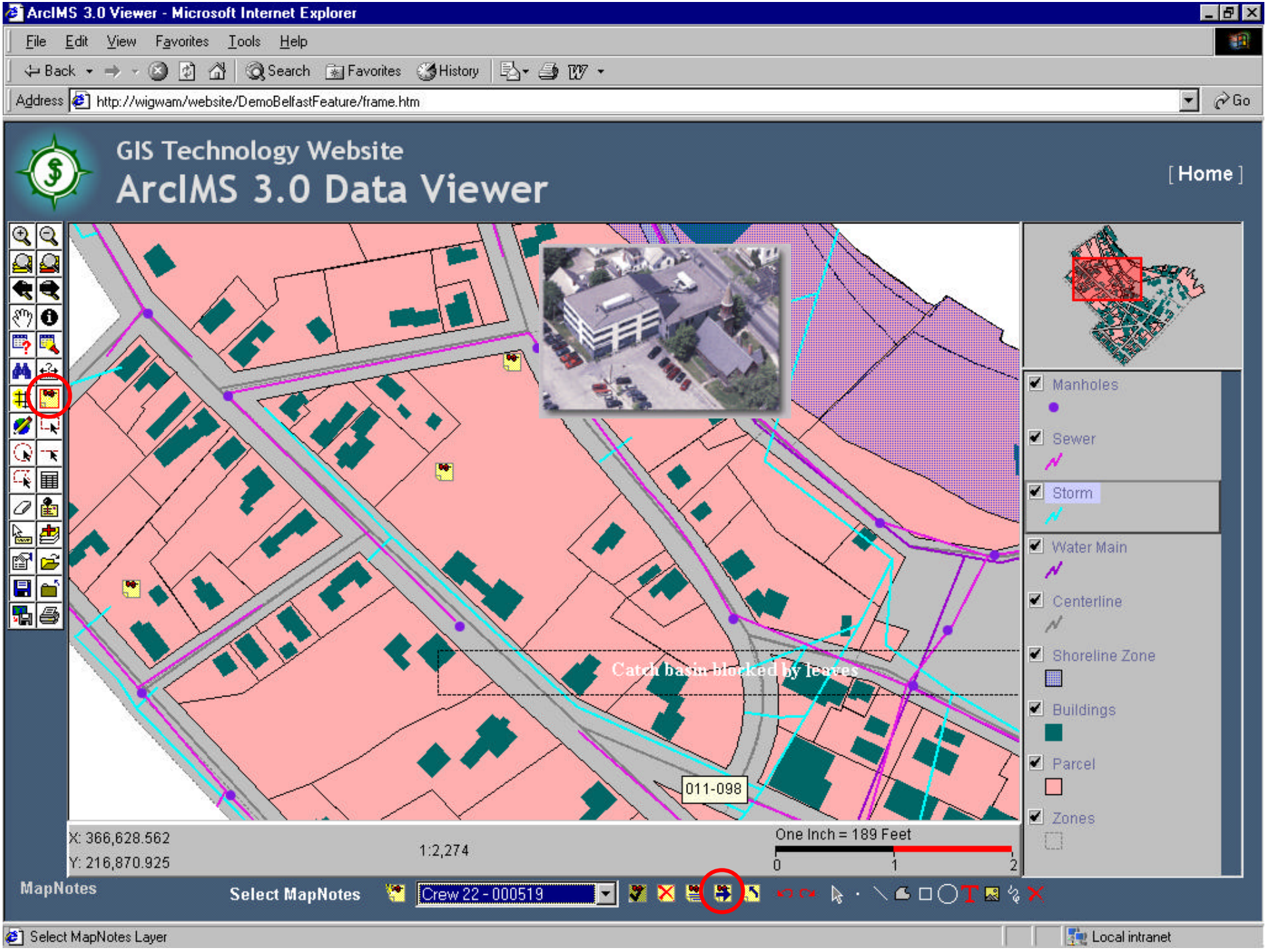
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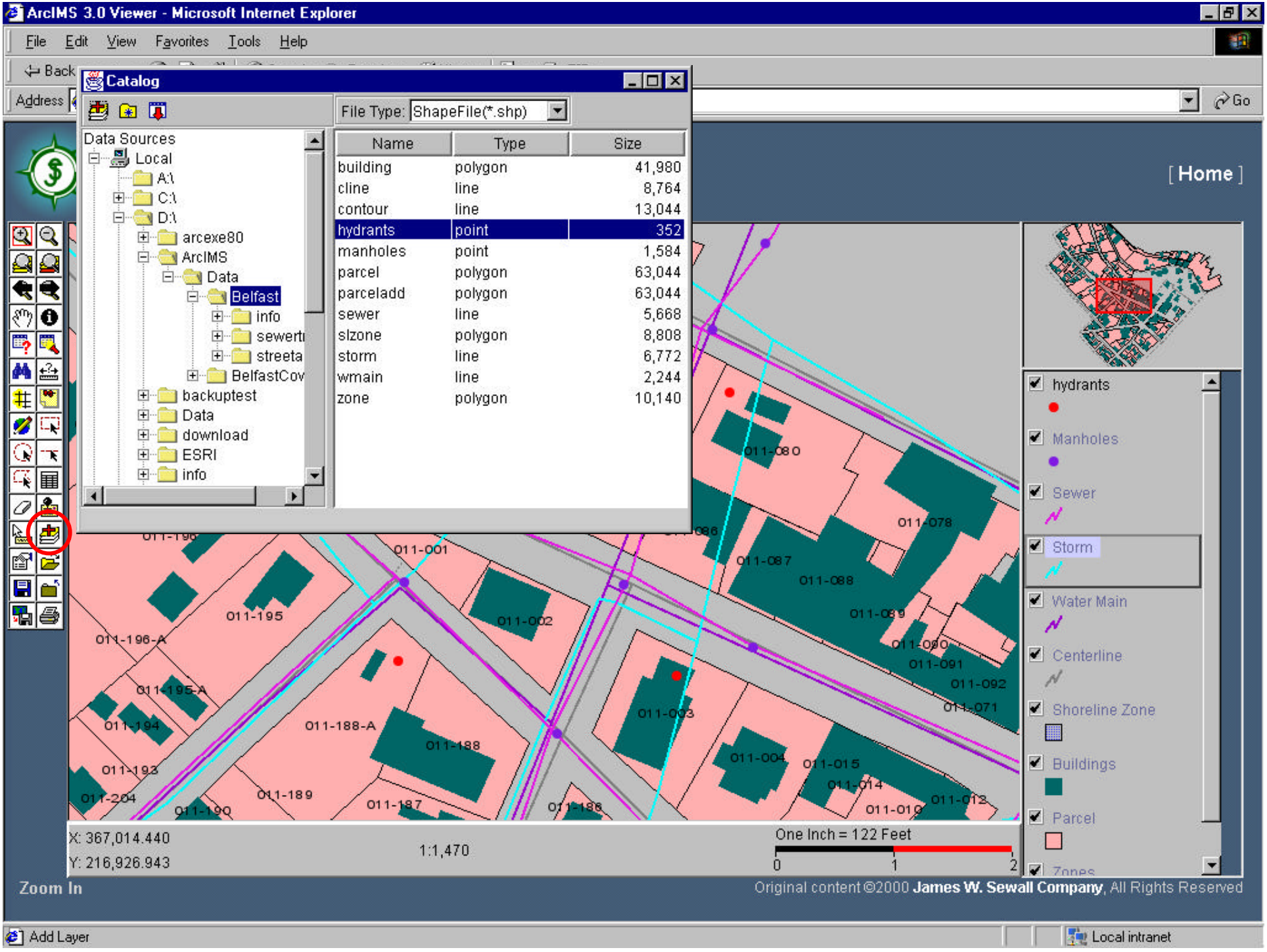
ArcIMS 3.0 Viewer - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Address
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Catalog
File Type: ShapeFile(*.shp)
Data Sources
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ArcIMS
Data
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info
Name Type Size
building polygon 41,980
cline line 8,764
contour line 13,044
hydrants point 352
manholes point 1,584
parcel polygon 63,044
parceladd polygon 63,044
sewer line 5,668
slzone polygon 8,808
storm line 6,772
wmain line 2,244
zone polygon 10,140
[Home]
hydrants
Manholes
Sewer
Storm
Water Main
Centerline
Shoreline Zone
Buildings
Parcel
Zones
011-080
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011-087
011-088
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011-014
011-012
011-010
011-195
011-196-A
011-195-A
011-194
011-193
011-204
011-190
011-189
011-188-A
011-188
011-187
011-186
X: 367,014.440
Y: 216,926.943
1:1,470
One Inch = 122 Feet
0 1 2
Zoom In
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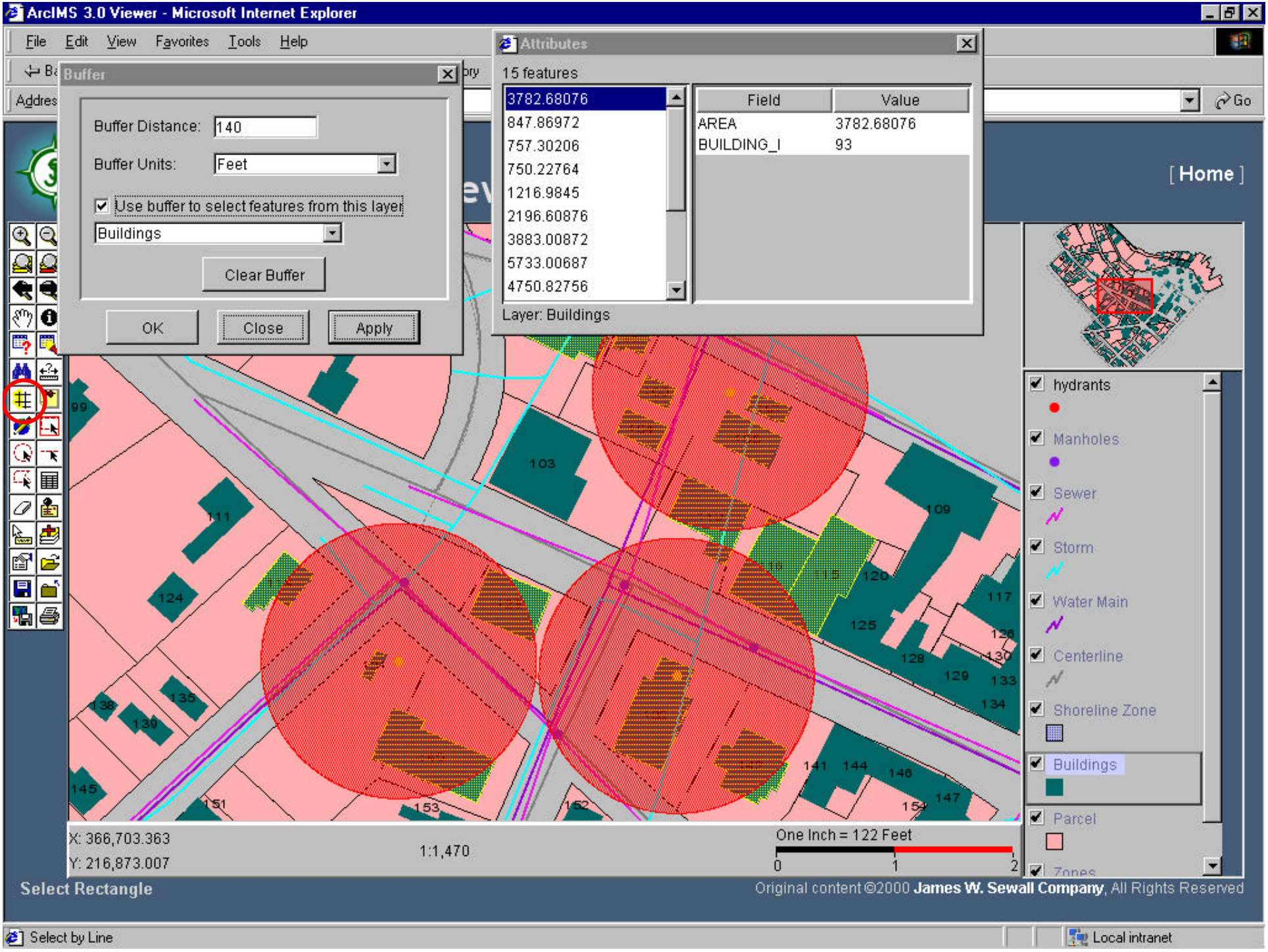
Add Layer
Local intranet


ArcIMS 3.0 Viewer - Microsoft Internet Explorer
File Edit View Favorites Tools Help
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Buffer Units: Feet
Use buffer to select features from this layer
Buildings
Clear Buffer
OK
Close
Apply
Attributes
15 features
3782.68076
847.86972
757.30206
750.22764
1216.9845
2196.60876
3883.00872
5733.00687
4750.82756
Field
Value
AREA
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Layer: Buildings
[Home]
hydrants
Manholes
Sewer
Storm
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Centerline
Shoreline Zone
Buildings
Parcel
Zones
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Y: 216,873.007
1:1,470
One Inch = 122 Feet
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Select Rectangle
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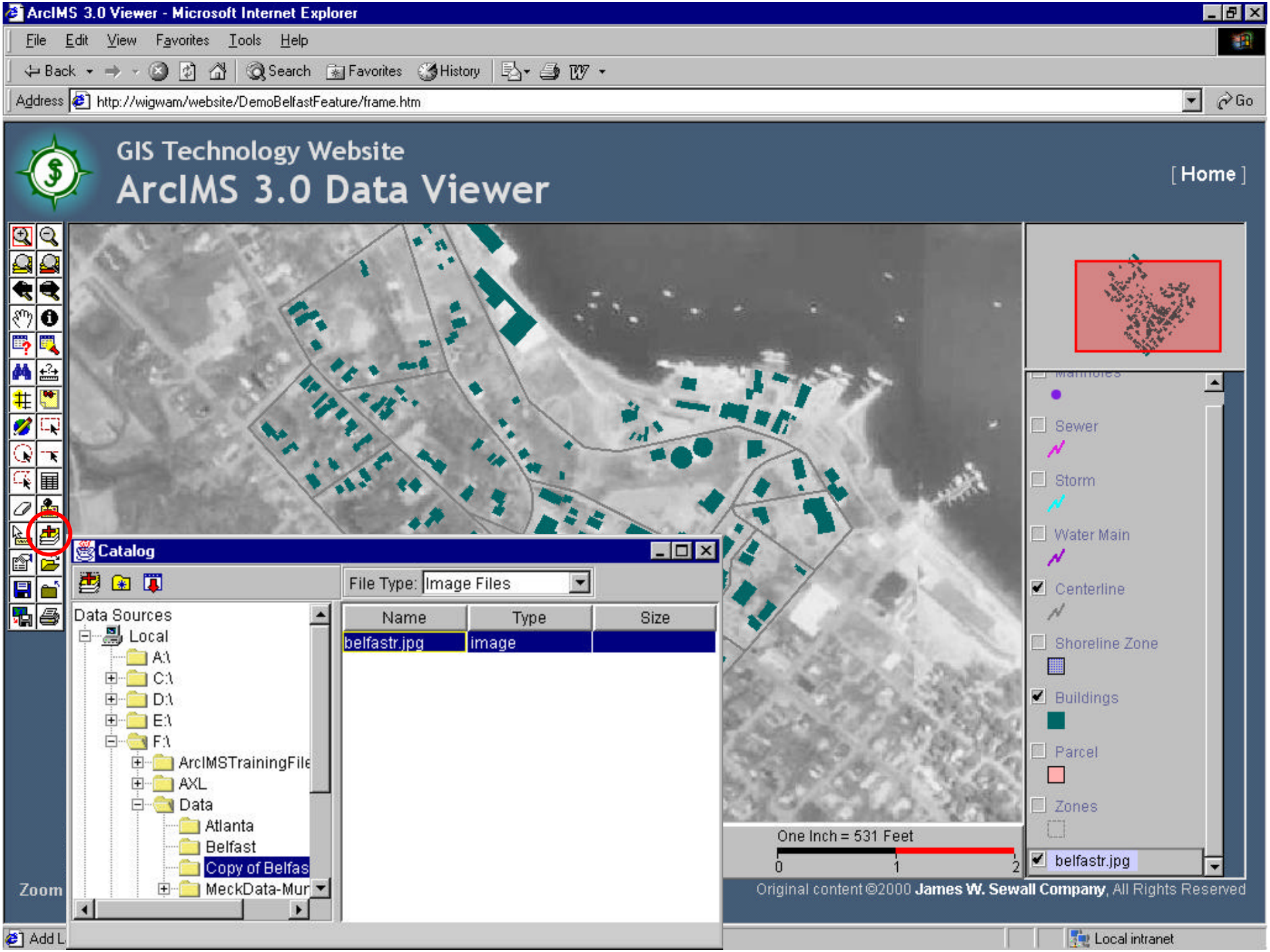
Select by Line
Local intranet


ArcIMS 3.0 Viewer - Microsoft Internet Explorer
File Edit View Favorites Tools Help
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GIS Technology Website
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Buildings
Parcel
Zones
belfastr.jpg
One Inch = 531 Feet
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Zoom
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Local intranet

Data Warehousing/Internet Access Benefits

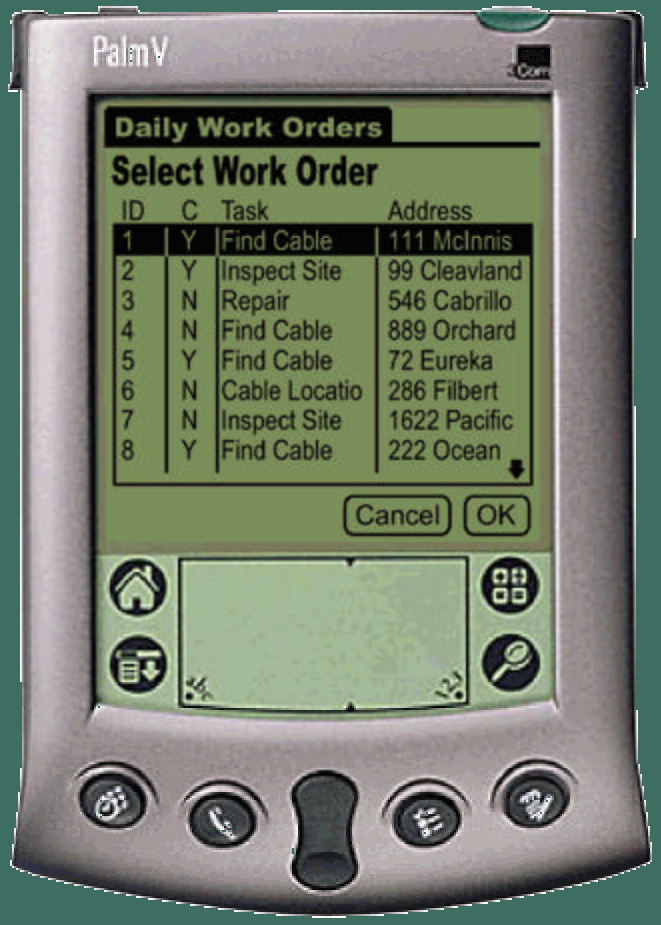
- **Provides employees and customers with Web access to data**
- **Provides a simple, unified interface to data for all users**
- **A single data source increases data consistency, data security, and data distribution among user groups**
- **Data posting is limited to select users, ensuring data quality**
- **Supports enterprise hardware and software independence**
- **Improves and streamlines work processes**
- **Significantly reduces both the initial implementation cost and ongoing maintenance costs**
- **Reduces expenditures on hardware, software, and technical staff**
- **Insulates installations from personnel dependencies**

Mobile Data Access Features

- **Interactive; data is dynamic, graphics are vector-based CAD files and/or generated from database data**
- **Supports enterprise database integration: data can be downloaded, edited, and posted to the enterprise data server**
- **Portable, inexpensive, and easy to use**

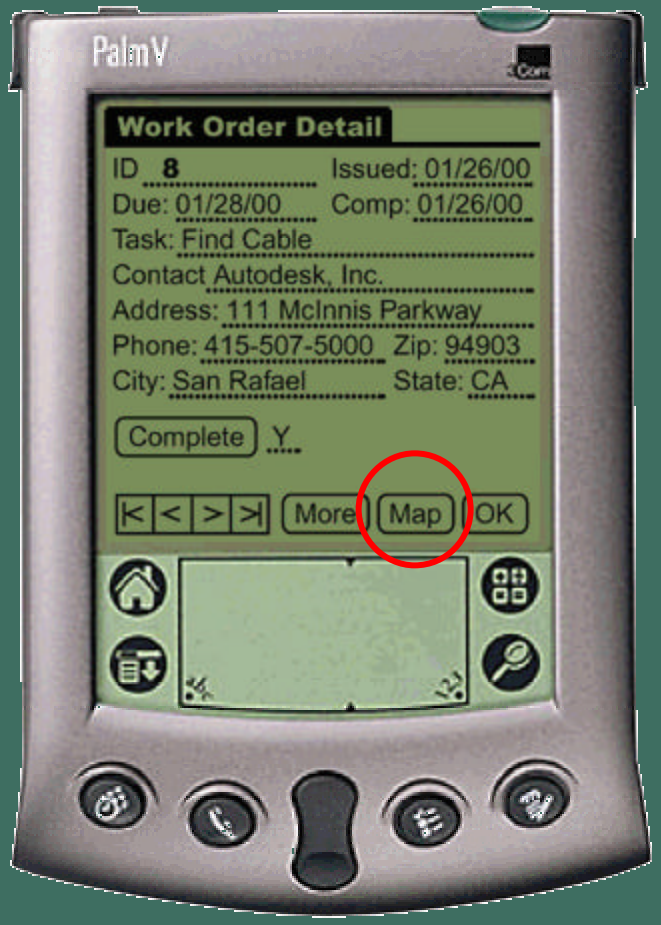
Work Order Process

The crew chief first downloads his or her crew's work orders for the day, along with a subset of the corporate geospatial database for those work orders.



Work Order Process

The crew chief can then review the details for each work order. Detail data is drawn from the downloaded and cached work order database.



Work Order Process

By tapping the Map button, the crew chief can then display a map of the area where the work is to be performed. The chief can zoom and pan within the view. Directions to the job site could also be displayed.

Work Order Process

By tapping on an item, specific data for the work order equipment can be displayed on top of the map. Similarly, underlying data for duct banks, addresses, and street names can be displayed.

Work Order Process

The crew chief can then enter job information pertaining to the work order. Job information is stored directly within the cached work order database. The job information can then be uploaded to the Operational Data Store for subsequent processing and posting to the Data Warehouse.

GPS and Scanner Integration

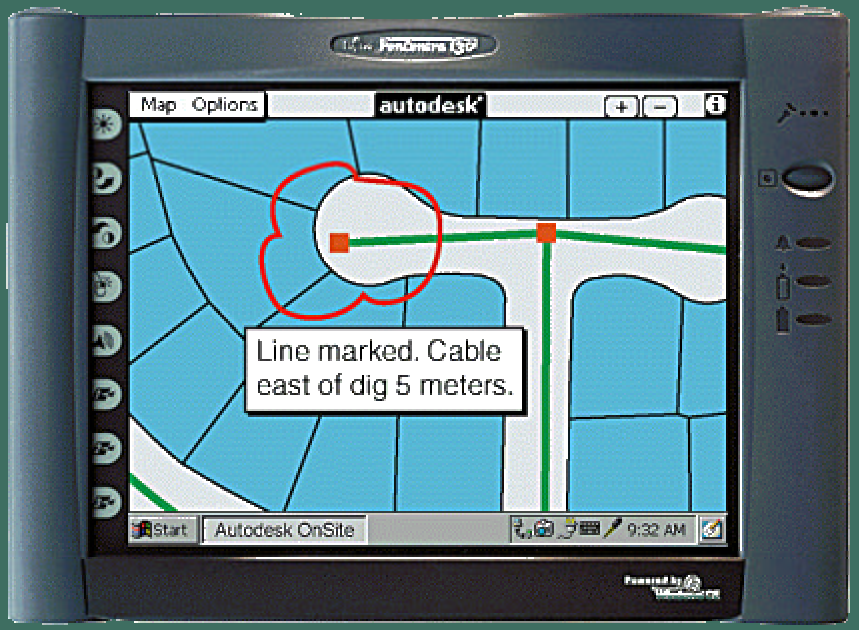
Palm Pilot devices can also be linked with a GPS unit and a bar code reader.

If equipment is bar coded, the system knows what equipment was placed and the coordinates of the job site. The crew chief only needs to record the time spent on the work order and any specific job notes.

Mobile Data Access Benefits

Reduced Expenses

- Potential to save several hours for work crews each day
- Lower operating expense for distributing and accessing data
- Better, faster, safer decisions through available, current data



Efficiency

- Avoids data duplication and enables data sharing

Speed and Flexibility

- Based on mobile enterprise protocols & standards (Oracle, Java)

Accuracy

- Data is posted to the corporate database by those who use the data

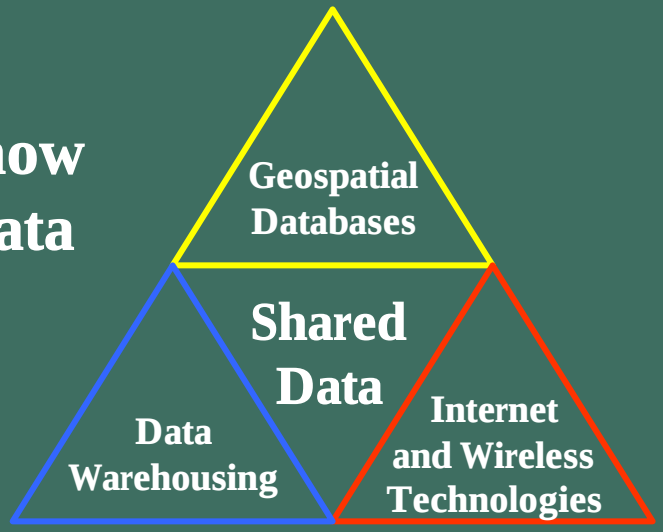
Successful GIS Implementation

Plan

1. **User Groups and Requirements**
2. **Data Assessment and Acquisition**
3. **Select Technology and Architecture**
4. **Application Configuration**
5. **Implementation**
6. **Training**
7. **Technical Support and Assessment**

Conclusion

- **Advances in database technology now support implementation of spatial data**
- **Data warehousing, Internet, and wireless technologies can increase usability of data and promote better analysis and decision making processes**



- **These technologies can increase operational efficiency, reduce costs, and improve accuracy and currency of data**
- **Questions?**

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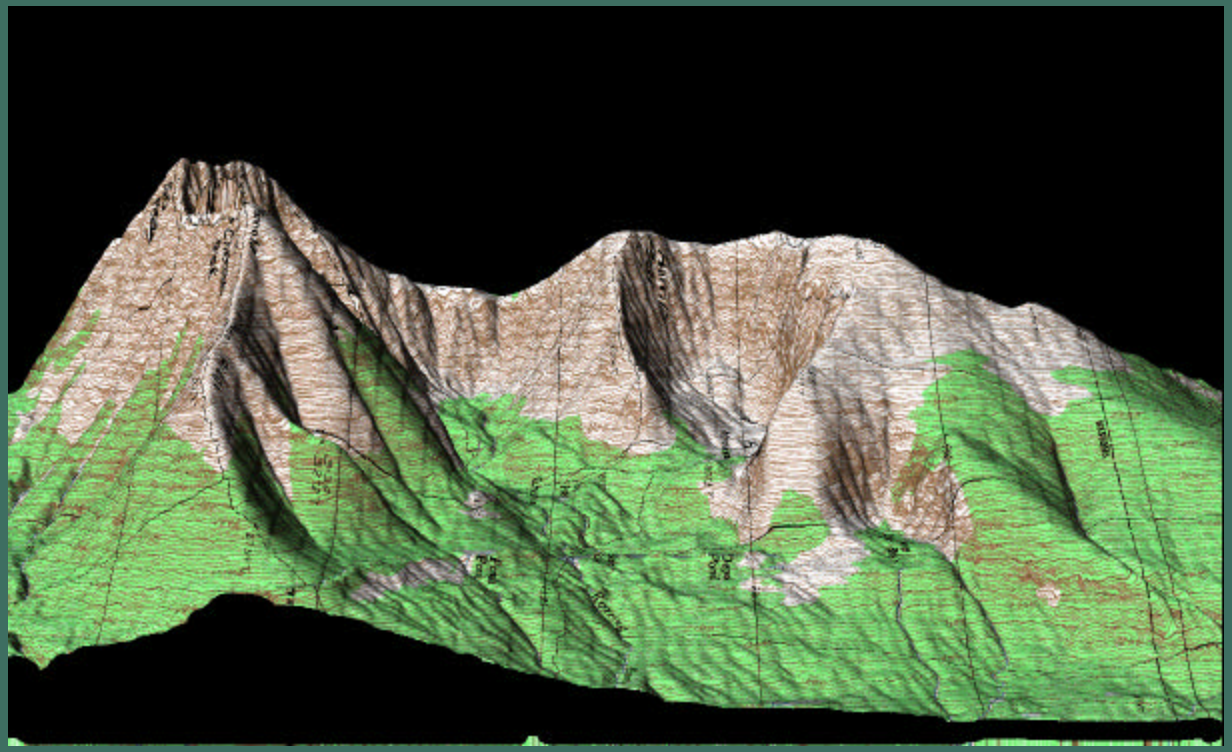
PO Box 433, 147 Center St
Old Town, ME 04468



Biography

Mr. John F. Dirkman, P.E. is a Project Manager with the James W. Sewall Company. His responsibilities include managing AM/FM/GIS projects for a variety of clients in the government, energy, and telecommunications industries. Prior to working at the James W. Sewall Company, Mr. Dirkman served as Project Manager with the Seattle District U.S. Army Corps of Engineers. His positions at the Corps included Assistant Chief, Design Branch, CADD/LAN System Administrator, and Electrical Engineer. Mr. Dirkman is a registered Professional Engineer, and holds a BS degree in Electrical Engineering.

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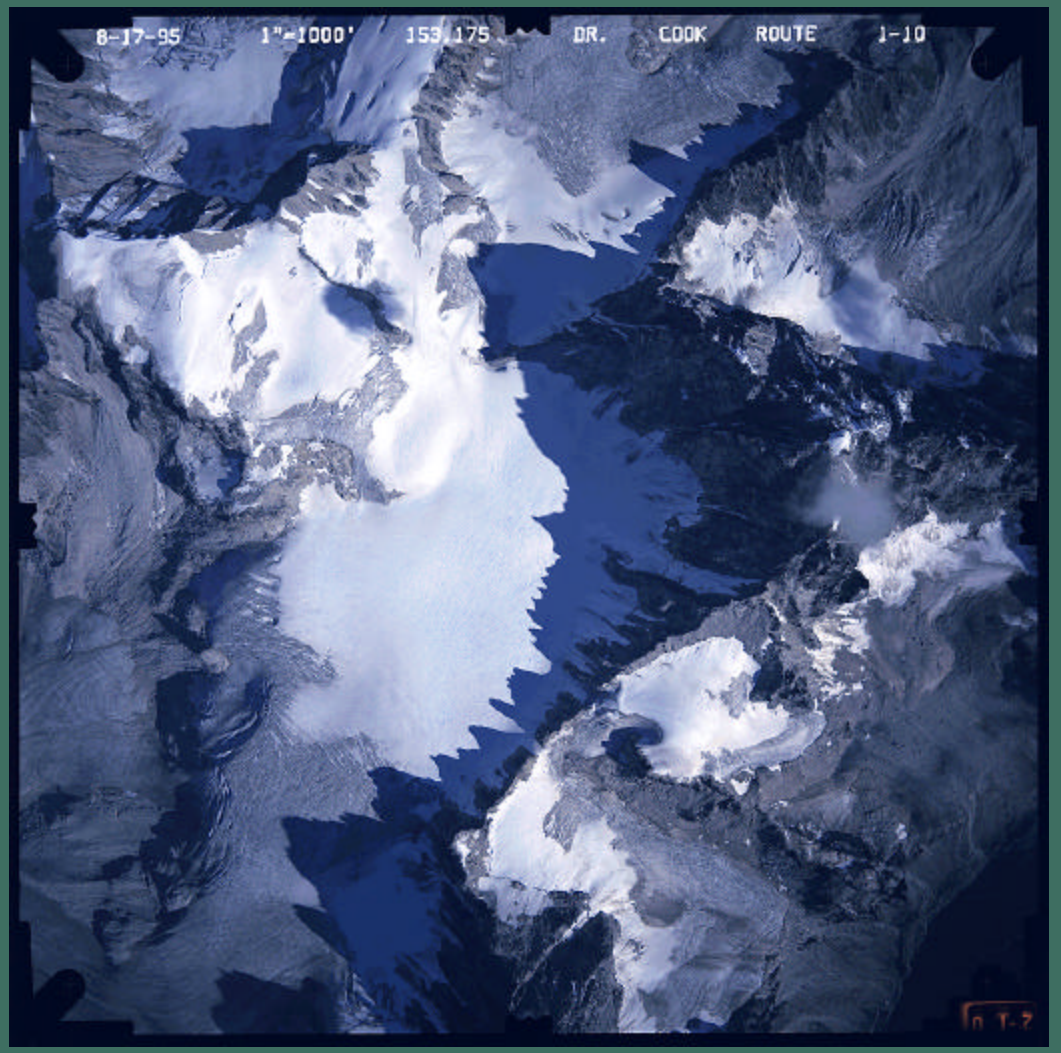
Efficient Production

Timely Delivery



Aerial Photograph of Mount McKinley, Alaska